

Message Text

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E.O. 11652: N/A

TAGS: TSPA, SF

SUBJECT: NASA LAUNCH OF VOYAGER SPACECRAFT

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1. SUPPLEMENTAL AIRGRAM INFO PROMISED PARA 7 REFTEL BEING SUPPLIED THIS CABLE AND WILL COVER TECHNICAL DESCRIPTION OF NUCLEAR POWER SYSTEMS AND ABORT GUIDELINES DURING PRE-OR TA PHASE. PARAS BELOW MAY BE USED IN RESPONSE TO QUERIES:
2. RADIOISOTOPE THERMOELECTRIC GENERATORS (RTG'S) ELEC-TRICAL POWER PROVIDED BY THREE MULTI-HUNDRED WATT (MHW)

RTG'S. EACH GENERATOR WEIGHS ABOUT 80 POUNDS AND PRODUCES APPROXIMATELY 150 WATTS OF ELECTRICAL POWER AT TIME OF LAUNCH. MISSION REQUIREMENT DURING 4-YEAR MINIMUM OPERATIONAL LIFE ARE 374 ELECTRICAL WATTS MINIMUM. SINGLE HEAT SOURCE ASSEMBLY (HSA) CONTAINED IN BERYLLIUM GENERATOR HOUSING AND PRODUCES NOMINAL 2400 THERMAL WATTS FROM 73,200 CURIES (CI) OF PLUTONIUM 238 DIOXIDE (PUO21). HEAT SOURCE CONTAINS 24 FUEL CONTAINERS ARRANGED IN SIX PLANES OF FOUR EACH AND HELD IN PLACE IN GROUPS OF EIGHT BY

SEGMENTED GRAPHITE RETAINING RINGS. WOVEN GRAPHITE CLOTH PADS ARE POSITIONED BETWEEN EACH PLANE TO ACHIEVE A COMPLIANCE FIT. ASSEMBLIES ARE PLACED WITHIN A POCO AXF-5Q1 GRAPHITE REENTRY AEROSHELL CYLINDER. EACH HEAT SOURCE CONTAINS ABOUT 6 KG (13.3 LBS.) OF PUO2. WITHIN BOTH ENDS OF AEROSHELL, GRAPHITE CRUSH-UP MATERIAL IS PROVIDED FOR ADDITIONAL IMPACT PROTECTION. AEROSHELL IS SECONDARY PLUTONIUM CONTAINMENT STRUCTURE AND ADDITIONAL PROTECTION. AN EMISSIVITY SLEEVE IS PROVIDED EXTERNAL TO GRAPHITE AEROSHELL. SLEEVE IS WOVEN GRAPHITE CYLINDRICAL SHELL MADE OF PYROCARB-406 WITH INTERNAL DIAMETER 7.160 INCHES (18.19 CM), OVERALL LENGTH 16.530 INCHES (41.99 CM) AND WALL THICKNESS OF 0.130 INCH (0.33 CM). SLEEVE ENHANCES RADIATION HEAT TRANSFER TO THERMOELEMENTS DURING NORMAL OPERATION AND PROVIDES ADDITIONAL STRENGTH AND PROTECTION FOR AEROSHELL DURING REENTRY. THE FUEL CONTAINERS (FSA) ARE PRIMARY PLUTONIUM CONTAINMENT STRUCTURES CONSTRUCTED OF HOT PRESSED AND SINTERED PLUTONIUM-238 DIOXIDE SPHERE PLACED WITHIN 0.020 INCH (0.051 CM) THICK IRIIDIUM POST-IMPACT CONTAINMENT SHELL (PICS) WHICH, IN TURN, IS PLACED WITHIN 0.460 INCH (1.17 CM) THICK GRAPHITE IMPACT SHELL (GIS). IRIIDIUM SHELL PROVIDES STRUCTURAL INTEGRITY AND EXCEPTIONAL RESISTANCE TO HIGH-TEMPERATURE DEGRADATION OR OXIDATION, WHILE GRAPHITE SHELL PROTECTS PICS DURING IMPACT AND IN THERMAL ENVIRONMENTS. PICS IS VENTED TO PROVIDE FOR RELEASE OF HELIUM GAS GENERATED IN FUEL DECAY PROCESS, BUT VENTING IS DESIGNED TO PREVENT DIRECT PATH FOR PARTICULATES TO TRAVEL BETWEEN FUEL AND VENT HOLE.

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TAINERS (FSA) ARE PRIMARY PLUTONIUM CONTAINMENT STRUCTURES CONSTRUCTED OF HOT PRESSED AND SINTERED PLUTONIUM-238 DIOXIDE SPHERE PLACED WITHIN 0.020 INCH (0.051 CM) THICK IRIIDIUM POST-IMPACT CONTAINMENT SHELL (PICS) WHICH, IN TURN, IS PLACED WITHIN 0.460 INCH (1.17 CM) THICK GRAPHITE IMPACT SHELL (GIS). IRIIDIUM SHELL PROVIDES STRUCTURAL INTEGRITY AND EXCEPTIONAL RESISTANCE TO HIGH-TEMPERATURE DEGRADATION OR OXIDATION, WHILE GRAPHITE SHELL PROTECTS PICS DURING IMPACT AND IN THERMAL ENVIRONMENTS. PICS IS VENTED TO PROVIDE FOR RELEASE OF HELIUM GAS GENERATED IN FUEL DECAY PROCESS, BUT VENTING IS DESIGNED TO PREVENT DIRECT PATH FOR PARTICULATES TO TRAVEL BETWEEN FUEL AND VENT HOLE.

3. RTG HEAT SOURCE FUEL

RADIOISOTOPE FUEL MATERIAL FOR RTG IS ISOTOPIC MIXTURE OF PLUTONIUM DIOXIDE, PUO2, CONTAINING 80.2 PERCENT PU-238 ISOTOPE. PHYSICAL FORM OF FUEL IS MULTIPLE SPHERE SHAPED, SOLID CERAMIC COMPACTS. INDIVIDUAL SPHERE DIAMETER 1.465 INCHES (3.72 CM) WITH DENSITY 9.05 GRAMS PER CUBIC CENTIMETER, OR APPROXIMATELY 78 PERCENT THEORETICAL

DENSITY, WITH SPECIFIC THERMAL POWER OF 0.4 WATTS PER GRAM (3.62 WATTS PER CUBIC CENTIMETER). HALF LIFE OF PU-238 ISOTOPE IS 87.6 YEARS.

DIRECT RADIATION FROM PLUTONIUM-238 DIOXIDE CHARACTERIZED BY 5.4 MEV ALPHA EMISSION, 17 KEV X-RAY, AND 0.5-4.4 MEV NEUTRON ENERGY SPECTRUM. EXPOSURE RATE AT CENTER PLANE OF GENERATOR SIDE APPROXIMATELY 50 MILLIREM PER HOUR AT DISTANCE OF ONE METER.

4. RADIOISOTOPE HEATER UNITS (RHU'S)

SPACECRAFT UTILIZES SMALL RADIOISOTOPE HEATER UNITS (RHU'S) TO PROVIDE HEAT TO CERTAIN COMPONENTS HAVING MINIMUM TEMPERATURE OPERATING LIMITS. EACH RHU PRODUCES LIMITED OFFICIAL USE

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ONE THERMAL WATT FROM PLUTONIUM-238 DIOXIDE DECAY AND IS USED SINGLY OR IN MULTIPLES FOR EACH COMPONENT, DEPENDING ON THE THERMAL INPUT REQUIREMENTS. SPACECRAFT COMPONENTS UTILIZING THE RHU'S INCLUDE MAGNETOMETERS, BOOM DAMPERS, SUN SENSORS, ETC. TWENTY-SEVEN RHU'S WILL BE USED PER SPACECRAFT.

RHU IS CYLINDER 0.87 IN. (2.21 CM) IN DIAMETER AND 1.85 IN. (4.7 CM) LONG AND OPERATES AT TEMPERATURES OF LESS THAN 200 DEGREES FARENHEIT (93.3 DEGREES CELSIUS). TOTAL WEIGHT OF EACH RHU IS 0.12 LB. (57 G). FUEL CAPSULE IS CYLINDER 0.39 IN. (1 CM) IN DIAMETER AND 1.13 IN. (2.87 CM) LONG AND CONSISTS OF RADIOISOTOPE FUEL, LINER, STRENGTH MEMBER, AND CLAD. RHU CAPSULES ARE SEALED AND HELIUM WHICH IS GENERATED BY RADIOACTIVE DECAY PROCESS IS COMPLETELY CONTAINED WITHIN THE CAPSULE. A COMPLETE RHU CONSISTS OF THE CAPSULE, THERMAL INSULATOR AND REENTRY MEMBER.

5. RHU FUEL

EACH RHU CONTAINS ONE THERMAL WATT (30 CI) OF PLUTONIUM-238 DIOXIDE IN FORM OF 53 TO 500 MICRON SHARDS ADMIXED WITH 0.136 G OF 0.254 MM THICK BY 1.6 MM SQUARE YTTRIUM FOIL CHIPS.

6. FOLLOWING IS EXCERPTED FROM GENERAL GUIDELINES IN EVENT OF ABORT (FOR POSTS' INFORMATION ONLY):

7. "PRE-ORBITAL ABORTS

"IF AN ABORT OCCURS PRIOR TO ACHIEVING ORBIT, ALONG A NORMAL TRAJECTORY, THE IMPACT WILL BE IN THE ATLANTIC LIMITED OFFICIAL USE

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OCEAN, AFRICA, THE INDIAN OCEAN, OR THE PACIFIC OCEAN. ABORTS WHICH RESULT IN IMPACTS IN DEEP OCEAN WILL NOT BE A HAZARD TO MARINE LIFE OR PEOPLE, AND THERE DO NOT APPEAR TO BE ANY COMPELLING SAFETY REASONS FOR CONDUCTING A SEARCH.

THE PROBABILITY OF AN IMPACT IN AFRICA IS SMALL. HOWEVER, IF SUCH AN IMPACT IS INDICATED IT WILL BE NECESSARY TO

EVALUATE THE TRACKING INFORMATION TO DETERMINE IF SEARCH CAN BE MEANINGFUL. DETECTION OF THE FUEL CAPSULES WILL BE EXTREMELY DIFFICULT. INFRARED AND NUCLEAR RADIATION DETECTION EQUIPMENT ARE AVAILABLE TO ASSIST IN LOCATING THE CAPSULES; HOWEVER, IT WILL BE DIFFICULT FOR THE INFRARED EQUIPMENT TO DIFFERENTIATE BETWEEN THE CAPSULE AND OTHER HEAT SOURCES IN THE AREA, INCLUDING LARGE TRUCKS, LOCOMOTIVES, CAMP FIRES, ETC. THE NUCLEAR RADIATION DETECTORS WILL BE REQUIRED TO APPROACH WITHIN A FEW HUNDRED FEET SINCE THE RADIATION LEVEL IS LOW. THUS, SEARCH IN A LARGE AREA WITHOUT BENEFIT OF VISUAL SIGHTINGS OR LATE TRAJECTORY TRACKING DOES NOT APPEAR TO OFFER A REASONABLE PROBABILITY OF RECOVERY AND, MORE-OVER, WOULD BE LIKELY TO CREATE AN ALARM GREATLY DIS-PROPORTIONATE TO THE ACTUAL HAZARD. END QUOTE.

IF OBORT OCCURS, RESPONSE TO QUERIES AND PRESS GUIDANCE WILL BE SENT IMMEDIATELY IF REQUIRED. FIRST REQUIREMENT WILL BE TO REPORT ANY SIGHTINGS AND INFORM HOST GOVERNMENT AS ADVISED BY DEPARTMENT. VANCE

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Message Attributes

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